

Grade 8 · Linear Functions and Modeling · Worksheet Answer Key

Common Core 8.F.B.4, 8.F.B.5 · mathovore.fr

Every problem from the linear functions worksheet is solved here step by step. Check the rate of change and the initial value first, then compare your equation with the one shown, and use the figures to see rise and run.

Grade 8 Common Core: 8.F.B.4 · 8.F.B.5

Problem 1: Rate from a table

Pick two columns: $m = \frac{7-4}{1-0} = 3$. Check another pair: $\frac{13-10}{3-2} = 3$.

The rate of change is 3.

Problem 2: Read the equation

The equation has the form $y = mx + b$.

(a) $m = 5$. (b) At $x = 0$, $y = 5(0) + 8 = 8$.

Rate of change 5, initial value 8.

Problem 3: Slope between two points

$$m = \frac{12-3}{4-1} = \frac{9}{3} = 3.$$

The rate of change is 3.

Problem 4: A negative rate

$$m = \frac{1-9}{6-2} = \frac{-8}{4} = -2.$$

The rate is negative, so the function is **decreasing** with rate of change -2 .

Problem 5: Linear or nonlinear?

Table A: the changes in y are 2, 4, 8. They are not equal, so A is **nonlinear**.

Table B: the changes are 4, 4, 4. They are equal, so B is **linear** with rate 4.

Problem 6: Increasing or decreasing

Graph A falls from left to right in a straight line: **decreasing and linear** (rate -1).

Graph B rises and keeps getting steeper, so the rate of change is not constant: **increasing and nonlinear**.

Problem 7: Equation from a table

x increases by 2 and y increases by 6 each time, so $m = \frac{6}{2} = 3$.

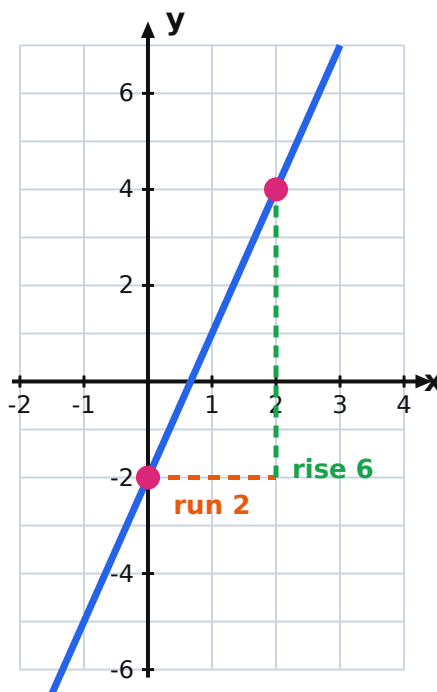
The column with $x=0$ gives $b=5$.

Equation: $y = 3x + 5$. Check: $3(6) + 5 = 23$.

Problem 8: Equation from a graph

The line crosses the y -axis at -2 , so $b = -2$.

From $(0, -2)$ to $(2, 4)$: run 2, rise 6, so $m = \frac{6}{2} = 3$.



Rise 6 over run 2.

Equation: $y = 3x - 2$.

Problem 9: Two points to equation

$$m = \frac{11-5}{3-1} = \frac{6}{2} = 3.$$

Use (1,5): $5 = 3(1) + b$, so $b = 2$.

Equation: $y = 3x + 2$. Check: $3(3) + 2 = 11$.

Problem 10: A fractional rate

$$m = \frac{8-4}{9-3} = \frac{4}{6} = \frac{2}{3}.$$

Use (3,4): $4 = \frac{2}{3}(3) + b$, so $4 = 2 + b$ and $b = 2$.

Equation: $y = \frac{2}{3}x + 2$. Check: $\frac{2}{3}(9) + 2 = 8$.

Problem 11: A point and a rate

Start with $y = -2x + b$ and substitute (4,10): $10 = -2(4) + b$.

$10 = -8 + b$, so $b = 18$.

Equation: $y = -2x + 18$.

Problem 12: The burning candle

The initial value is 12 and the rate is -1.5 inches per hour, so $h = 12 - 1.5t$.

At $t = 4$: $h = 12 - 1.5(4) = 12 - 6 = 6$.

The candle is **6 inches** tall after 4 hours.

Problem 13: Read a story graph

From 0 to 4 minutes the depth is increasing: $\frac{8-0}{4-0} = 2$ inches per minute.

From 4 to 7 minutes the depth is constant at 8 inches (rate 0).

From 7 to 9 minutes the depth is decreasing: $\frac{0-8}{9-7} = -4$ inches per minute.

Rates: 2 in/min and -4 in/min.

Problem 14: Match the graph to the story

The trip has three parts: rising (moving away), level (resting), and falling to the start (going home).

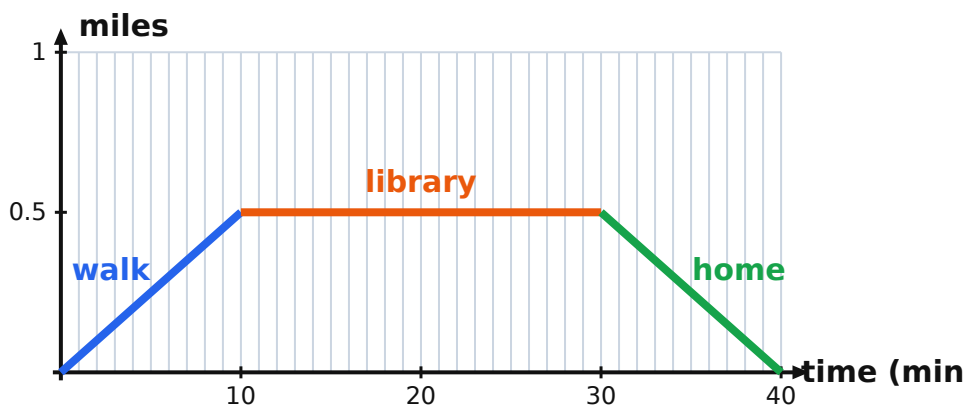
Graph B never comes home and Graph C never rests, so they do not fit. In Graph A the falling

part is steeper than the rising part, matching a faster walk home.

The answer is **Graph A**.

Problem 15: Sketch a trip

Three parts: from 0 to 10 minutes the graph rises to 0.5 mile; from 10 to 30 minutes it is level at 0.5 mile; from 30 to 40 minutes it falls back to 0.

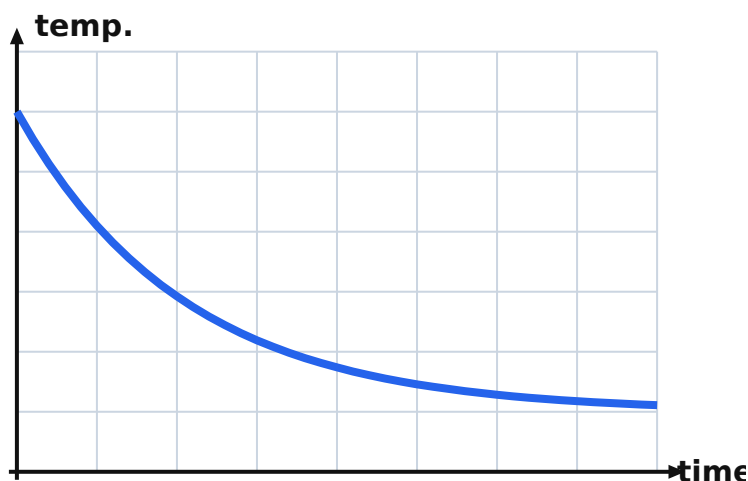


The rates are $\frac{0.5}{10} = 0.05$ mile per minute, 0, and -0.05 mile per minute.

Answer: **rise, level, fall** as sketched.

Problem 16: Sketch a cooling curve

The graph starts high and falls steeply, then flattens out as it nears room temperature.



The steepness changes, so the rate of change is not constant: the function is **nonlinear**.

Problem 17: Taxi fare

(a) $C = 2m + 3.5$.

(b) The rate is \$2 per mile. The initial value is \$3.50, the flat fee.

(c) $C = 2(9) + 3.5 = 18 + 3.5 = 21.5$.

The ride costs **\$21.50**.

Problem 18: Ethan's savings

(a) $m = \frac{165-120}{6-3} = \frac{45}{3} = 15$. Then $120 = 15(3) + b$ gives $b = 75$. So $y = 15x + 75$.

(b) He saves \$15 per week and started with \$75.

(c) $15x + 75 = 300$, so $15x = 225$ and $x = 15$.

He reaches \$300 after **15 weeks**.

Problem 19: A draining tank

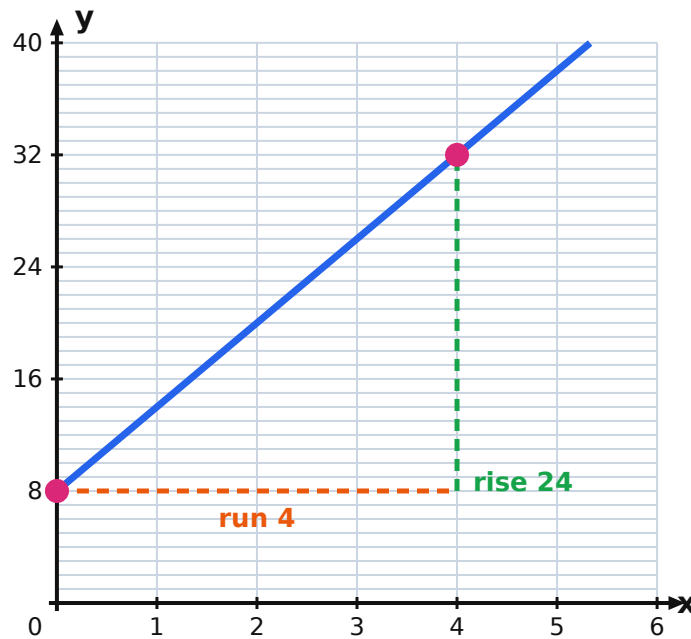
(a) $m = \frac{160-240}{7-3} = \frac{-80}{4} = -20$. Then $240 = -20(3) + b$ gives $b = 300$. So $y = -20x + 300$.

(b) The initial value is **300 gallons**.

(c) $-20x + 300 = 0$, so $x = 15$. The tank is empty after **15 hours**.

Problem 20: Kayak rental graph

(a) The line crosses the vertical axis at 8, so the initial value is **\$8**. From (0,8) to (4,32):
 $m = \frac{24}{4} = 6$ dollars per hour.



Rise 24 over run 4.

(b) $C = 6h + 8$.

(c) $C = 6(7) + 8 = 42 + 8 = 50$. The cost is **\$50**.

Problem 21: Filling a pool

(a) For equal steps of 2 minutes, g changes by 30, 30, 30. The change is constant, so the function is linear with $m = \frac{30}{2} = 15$.

(b) $50 = 15(2) + b$ gives $b = 20$. So $g = 15t + 20$.

(c) $g = 15(25) + 20 = 375 + 20 = 395$. About **395 gallons**.

Problem 22: Two dog walkers

Noah: N changes by 7 each hour, so $m = 7$. From $17 = 7(1) + b$, $b = 10$. So $N = 7h + 10$.

For 10 hours: $S = 9(10) + 12 = 102$ and $N = 7(10) + 10 = 80$.

Sofia earns \$22 more than Noah.

Problem 23: Area or perimeter?

Perimeter: P changes by 4 every time s increases by 1 (4, 8, 12, 16), so it is linear: $P = 4s$, rate 4 inches per inch, initial value 0.

Area: the changes are 3, 5, 7, which are not equal, so the area function is **nonlinear**.